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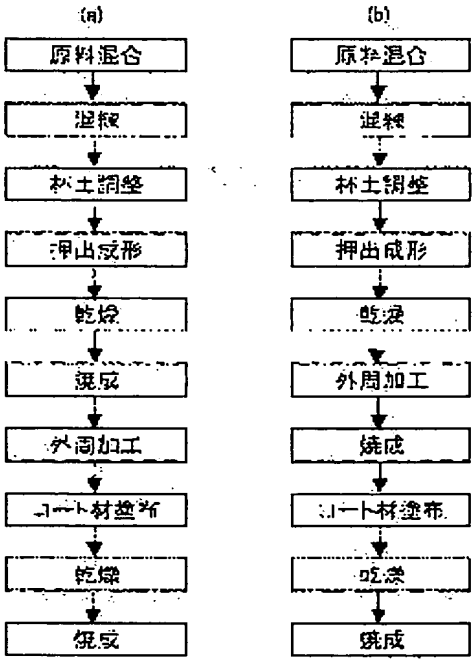
(54) CERAMIC HONEYCOMB STRUCTURE, ITS MANUFACTURING PROCESS AND COATING MATERIAL

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a ceramic honeycomb structure having a thermal shock resistance, strength and reliability by solving the problem that an external wall cracks when drying is performed by selecting an appropriate coating material for forming the external wall.

SOLUTION: In a process for manufacturing the ceramic honeycomb structure, an edge of the ceramic honeycomb structure is removed through processing, and the coating material is applied to the external surface to form the external wall part. Here, the coating material essentially comprises, by mass, 100 pts. cordierite particles and/or ceramic fibers and 3-35 pts. colloidal oxide in terms of solid content and further contains a colloidal oxide-dispersed substance.



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CLAIMS

[Claim(s)]
[Claim 1]
The manufacture approach of the ceramic honeycomb structure object characterized by said coat material containing the aggregate, a colloid oxide, and the colloid oxide distribution matter in the manufacture approach of the ceramic honeycomb structure object which applies coat material to a peripheral face and forms a periphery wall after processing removes the periphery section of a ceramic honeycomb structure object.
[Claim 2]
the manufacture approach of the ceramic honeycomb structure object according to claim 1 characterized by for 5 - 50 mass section coming out of the colloid oxide distribution matter comparatively to the solid content 100 mass section of said colloid oxide, and containing while said coat material contains 3 - 35 mass section for colloid oxide by solid content conversion to said cordierite particle and/or the ceramic fiber 100 mass section by using a cordierite particle and/or ceramic fiber, colloid oxide, and the colloid oxide distribution matter as a principal component.
[Claim 3]
The manufacture approach of the ceramic honeycomb structure object according to claim 1 or 2 characterized by more than 50 mass % being [of said colloid oxide distribution matter] a water-soluble organic substance at least.
[Claim 4]
Coat material for forming the peripheral wall of the ceramic honeycomb structure object characterized by including the aggregate, a colloid oxide, and the colloid oxide distribution matter.
[Claim 5]
the coat material for forming the peripheral wall of the ceramic honeycomb structure object according to claim 4 characterized by for 5 - 50 mass section coming out of 3 - 35 mass section and the colloid oxide distribution matter comparatively to the solid content 100 mass section of said colloid oxide, and including colloid oxide by solid content conversion to the cordierite particle and/or ceramic fiber 100 mass section by using a cordierite particle and/or ceramic fiber, colloid oxide, and the colloid oxide distribution matter as a principal component.
[Claim 6]
The ceramic honeycomb structure object characterized by the ratios [So/Sc] of the silicon concentration near the front face of said periphery wall (So) and the silicon concentration (Sc) of the thickness direction core of said periphery wall being 1.00-1.20 while the periphery wall of a ceramic honeycomb structure object which has the circulation hole of a large number divided by the septum consists of a silica matrix formed of a cordierite particle and/or ceramic fiber, and the colloidal silica that exists among them.
[Claim 7]
The ceramic honeycomb structure object both characterized by the thing whose periphery wall of a ceramic honeycomb structure object which has the circulation hole of a large number divided by the septum serves as a cordierite particle and/or ceramic fiber from the alumina matrix formed with the colloidal alumina with which it exists among them, and for which the ratio [Ao/Ac] of the aluminum concentration near the front face of said periphery wall (Ao) and the aluminum concentration (Ac) of the core of said peripheral wall is set to 1.00-1.20.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the manufacture approach of the peripheral wall of a ceramic honeycomb structure object.
[0002]
[Description of the Prior Art]
In order to reduce the harmful matter contained in the exhaust gas of engines, such as an automobile, from the maintenance side of a local environment or earth environment, the catalytic converter for exhaust gas purification and the filter for particle uptake which used the ceramic honeycomb structure object are used.
Drawing 2 is the perspective view of a honeycomb structure object. As shown in drawing 2 , the honeycomb structure object 1 usually has the cel 2 of a large number formed with the peripheral wall 3 and the cell wall 4 which intersects perpendicularly with the inner circumference side of this peripheral wall 3 respectively. And the honeycomb structure object 1 is firmly grasped by the grasping member arranged between stowage container inner skin and the peripheral-wall peripheral face of a honeycomb structure object, and is contained so that it may not move within a metal stowage container (not shown).
[0003]
The honeycomb structure object 1 is conventionally manufactured at the following processes.
The Plastic solid which has the honeycomb structure in which the peripheral wall 3 and the cell wall 4 were formed is acquired by carrying out extrusion molding of the ceramic plastic matter which mixed and kneaded cordierite generation raw material powder, a shaping assistant and an ostomy agent, and water, and obtained them through special metal mold. Next, with the drying furnace, evaporation desiccation of the moisture in a Plastic solid etc. was carried out, and the honeycomb structure object 1 which calcinates under predetermined temperature, has a predetermined configuration and reinforcement, and has detailed pore in a cell wall 4 with a firing furnace further after removing shaping assistants, such as a binder in a Plastic solid, etc. had been acquired.
[0004]
Die length by 150mm or more A large-sized ceramic honeycomb structure object 150mm or more, [the outer diameter for diesel power plants] When the thickness of a cell wall 4 manufactures the thin honeycomb structure object 1 with 0.2mm or less, Since the self-weight of a Plastic solid was too large at the time of extrusion molding or own reinforcement of a Plastic solid was inadequate for it, supporting a self-weight could not be finished, and the cell wall 4 of the periphery section of a peripheral wall 3 was crushed, or it deformed, and there was a problem that predetermined reinforcement was not obtained after baking.
[0005]
In order to solve this problem, in invention of a publication, in the patent reference 1 As the production process is shown in drawing 1 (a), a shaping assistant and/or ostomy material are added and prepared in a cordierite-ized raw material. Mixed kneading is carried out and it plasticizes possible [extrusion molding]. This ceramic **** Extrusion molding, After considering as the baking object which dries, calcinates and has honeycomb structure, removal processing which makes

smaller than a predetermined dimension the peripheral wall 3 and its periphery section of the baking object which has this honeycomb structure by the grinding process is performed. The approach of making the periphery which carried out removal processing apply, dry and harden a coating material, and forming the outer wall section is indicated. Since the peripheral wall 3 and its periphery section of the baking object which has honeycomb structure are removed by the grinding process according to this invention and the cel which the periphery section of a peripheral wall deformed can be removed, it is supposed that the mechanical strength of a honeycomb structure object can be made high. Moreover, also when the roundness of the whole baking object which has honeycomb structure is low, it is supposed that dimensional accuracy will improve by forming an envelope after a grinding process raises roundness. And as a coating material for forming the outer wall section used in this conventional invention, if ceramic fiber and an inorganic binder are used, reinforcement of the outer wall section can be made high, and further, since the coefficient-of-thermal-expansion difference of a honeycomb structure object body and the baking object of the same kind which has honeycomb structure when cordierite powder is added, for example can be lessened at a coating material, it is supposed that it is desirable.

[0006]

Furthermore, in order to acquire the honeycomb structure object in the honeycomb structure object of the above configurations which has improved the peeling resistance from the honeycomb structure object body of the outer wall section, and was excellent in thermal resistance and thermal shock resistance, By the patent reference 2, the outer wall section (outer shell layer) A cordierite particle and/or ceramic fiber, Invention of the ceramic honeycomb structure object characterized by coming to constitute from an amorphous oxide matrix formed with the colloidal silica or the colloidal alumina which exists among them is indicated. According to this invention, the honeycomb body which has the crevice extended to shaft orientations in a peripheral face is used. Carrying out reinforcement effective in a honeycomb structure object, since it was filled up with the coat material which becomes this concave from the cordierite aggregate and an inorganic binder and the outer shell layer is prepared The fall of the thermal shock reinforcement of the honeycomb structure object which prevents the fall of the honeycomb structure object by exfoliation of the coat layer which is an outer shell layer on the strength while in use, and is caused in the case of reinforcement of a honeycomb structure object is carried out to the ability to make it control effectively. And the coat material used by this invention makes small the coefficient-of-thermal-expansion difference of an outer shell layer and a honeycomb structure object body, and it is making colloid oxide blend at a rate of 3 - 35 weight section by solid content conversion to the 100 weight sections of said cordierite particle and/or ceramic fiber as a principal component, including a cordierite particle and/or ceramic fiber, and the colloid oxide that consists of colloidal silica or a colloidal alumina in order to prevent that a crack occurs in an outer shell layer with thermal stress.

[0007]

[Patent reference 1]

JP,3-275309,A

[Patent reference 2]

JP,5-269388,A

[0008]

[Problem(s) to be Solved by the Invention]

Although the problem which the cell wall of the periphery section of a peripheral wall generated from the basic configuration in case an outer diameter carries out extrusion molding of the honeycomb structure object with as thin thickness [a large-sized ceramic honeycomb structure object 150mm or more and the thickness of a cell wall] die length as 0.2mm or less by 150mm or more is crushed, or deforms was solvable according to invention given in the above-mentioned conventional patent reference 2, there were the still more nearly following troubles.

[0009]

In case coat material is applied to the peripheral face of the honeycomb structure object body with which the periphery section of a honeycomb baking object was beforehand removed by processing, and the concave was formed in the peripheral face Coat material A cordierite particle and/or ceramic fiber, The workability of covering to a honeycomb body is taken into consideration including the

colloid oxide which consists of colloidal silica or a colloidal alumina as a principal component. After assistants and water, such as an organic binder, are made to blend suitably if needed, spreading on a honeycomb body is made by the approach of brushing, a dipping method, a spray coat, etc. [, such as a viscosity controlling agent,] Then, although baking actuation was performed to the desiccation actuation pan if needed and the peripheral wall fixed on the honeycomb body, the problem that a crack occurred was in the periphery wall layer on the occasion of this desiccation actuation.
[0010]
Thus, if a crack occurs in a peripheral wall at a desiccation process, even if it performs baking actuation after that, the crack which carried out opening once cannot be closed, but a crack will remain to the peripheral wall of a honeycomb structure object. mechanical shocks by hot exhaust gas, such as a thermal shock, engine vibration, and road surface vibration, if the honeycomb structure object which has a peripheral wall with such a crack is used as the catalyst support for exhaust gas purification, or a filter for particle uptake -- a crack -- a honeycomb structure object body -- progressing -- just -- being alike -- since a ceramic honeycomb structure object becomes impossible within a metal stowage container as for dedropping and emission gas purification, it cannot be used substantially. Therefore, actually, by the inspection within a process of a product, it becomes a rejection judging and is discarded.
[0011]
Therefore, the purpose of this invention is choosing appropriately the coat material which forms a peripheral wall, solves the problem of the crack generated in a peripheral wall at the time of desiccation, and is to offer the manufacture approach of a ceramic honeycomb structure object of having reinforcement, thermal shock resistance, and dependability.
[0012]
[Means for Solving the Problem]
this invention persons inquired wholeheartedly about the cause of generating of the crack of the peripheral wall at the time of the above-mentioned desiccation. Consequently, in case the coat layer applied to the periphery is dried, migration (evaporation) of the moisture from the peripheral-wall thickness direction core to a peripheral face takes place, with migration of the moisture, a colloid oxide also moves to a peripheral-wall front-face side, and a difference produces it to colloid oxide concentration in a peripheral-wall front face and the peripheral-wall thickness direction core. Since this colloid oxide contained moisture so much and contraction was sharply caused at the time of desiccation, in connection with the concentration difference of periphery Kabeuchi's colloid oxide, the difference arose in the amount of contraction of a peripheral wall, contraction of a peripheral-wall outside surface with the high concentration of a colloid oxide became large, and it traced that it was the cause of main that a crack occurs. When this invention persons could control migration of this colloid oxide, the crack at the time of desiccation of such a peripheral wall thought that it was hard to be generated, and it hit on an idea of it to this invention.
[0013]
That is, after the manufacture approach of the ceramic honeycomb structure object of this invention removes the periphery section of a ceramic honeycomb structure object by processing, it is characterized by said coat material containing the aggregate, a colloid oxide, and the colloid oxide distribution matter in the manufacture approach of the ceramic honeycomb structure object which applies coat material to a peripheral face and forms a periphery wall.
[0014]
Moreover, in the manufacture approach of the ceramic honeycomb structure object of this invention, while said coat material uses a cordierite particle and/or ceramic fiber, colloid oxide, and the colloid oxide distribution matter as a principal component and contains 3 - 35 mass section for colloid oxide by solid content conversion to said cordierite particle and/or the ceramic fiber 100 mass section, it is good to include the colloid oxide distribution matter at a rate of 5 - 50 mass section to the solid content 100 mass section of said colloid oxide.
Furthermore, in the manufacture approach of the ceramic honeycomb structure object of this invention, the colloid oxide distribution matter is good in more than 50 mass % being a water-soluble organic substance at least.
[0015]

The coat material of this invention is characterized [the] by including the aggregate, a colloid oxide, and the colloid oxide distribution matter by the coat material used for the manufacture approach of a ceramic honeycomb structure object.
Moreover, the coat material of this invention is good to use a cordierite particle and/or ceramic fiber, colloid oxide, and the colloid oxide distribution matter as a principal component, and to include 3 - 35 mass section and the colloid oxide distribution matter for colloid oxide at a rate of 5 - 50 mass section to the solid content 100 mass section of said colloid oxide to the cordierite particle and/or ceramic fiber 100 mass section by solid content conversion.
[0016]
The ceramic honeycomb structure object of this invention is characterized by the ratios [So/Sc] of the silicon concentration near the front face of said periphery wall (So) and the silicon concentration (Sc) of the thickness direction core of said periphery wall being 1.0-1.20 while the periphery wall of a ceramic honeycomb structure object which has the circulation hole of a large number divided by the septum consists of a silica matrix formed of a cordierite particle and/or ceramic fiber, and the colloidal silica that exists among them.
[0017]
Moreover, the ceramic honeycomb structure object of this invention The periphery wall of a ceramic honeycomb structure object which has the circulation hole of a large number divided by the septum A cordierite particle and/or ceramic fiber, it consists of an alumina matrix formed with the colloidal alumina which exists among them -- both It is characterized by the ratios [Ao/Ac] of the aluminum concentration near the front face of said periphery wall (Ao) and the aluminum concentration (Ac) of the core of said peripheral wall being 1.0-1.20.
[0018]
[Function]
An operation of this invention and effectiveness are explained.
By combining between the ceramic aggregates firmly and forming a periphery wall layer, since the coat material for forming the peripheral wall of the ceramic honeycomb structure object of this invention contains the colloid oxide, it is firm and a peripheral wall strong also against a thermal shock is formed. Since the colloid oxide distribution matter is furthermore included, also in case moisture evaporates rapidly from a periphery wall in the desiccation process after coat material spreading In order to act so that the colloid oxide distribution matter may prevent migration on the periphery wall front face of the colloid oxide accompanying migration of moisture and the concentration difference of the colloid oxide of a periphery wall outside surface and the periphery wall thickness direction core may not become large, It can prevent a crack occurring in a coat layer in connection with the difference of the amount of contraction at the time of desiccation.
Furthermore, since the concentration difference between the periphery wall front face of the oxide matrix formed from a colloid oxide and a periphery wall core is small, thermal shock resistance can be made to improve in the case of the ceramic honeycomb structure object of this invention.
[0019]
While containing 3 - 35 mass section for a colloid oxide by solid content conversion to the cordierite particle and/or ceramic fiber 100 mass section, coat material here When the colloid oxide distribution matter is included at a rate of 5 - 50 mass section to the solid content 100 mass section of said colloid oxide As especially described above, the effectiveness of improving thermal shock resistance with it preventing a colloid oxide moving to a periphery wall front face, and the crack at the time of desiccation being prevented certainly is large.
[0020]
It is because good one may be unable to combine firmly between the aggregates of a cordierite particle and/or ceramic fiber under by 3 mass % if coat material contains colloid oxide at a rate of 3 - 35 mass section by solid content conversion to the cordierite particle and/or ceramic fiber 100 mass section, and is because the heat characteristic of a peripheral wall will worsen and a crack will become easy to go into a peripheral wall by the thermal shock the time of baking, and in use, if 35 mass % is exceeded. The content of more desirable colloid oxide is the rate of 7 - 20 mass section in solid content conversion about colloid oxide to the cordierite particle and/or ceramic fiber 100 mass section.

[0021]
When the colloid oxide distribution matter is included at a rate of 5 - 50 mass section to the solid content 100 mass section of said colloid oxide, moreover, good one The colloid oxide distribution matter under in 5 mass sections The effectiveness which controls migration of the colloid oxide accompanying moisture evaporation at the time of the desiccation after coat material spreading is small. It is because the concentration difference within the periphery wall of the oxide matrix formed from a colloid oxide may become large, thermal shock resistance may fall and a crack may occur in a periphery wall at the time of a spalling test. It is because it may become difficult to be filled up with coat material and reinforcement may fall to the crevice which will be formed in the peripheral face after the viscosity of coat material becomes high, spreading of coat material becomes difficult and processing removes the periphery section of a honeycomb structure object if the colloid oxide distribution matter exceeds 50 mass sections and which is extended to shaft orientations. Furthermore, the content of the desirable colloid oxide distribution matter is the rate of 7 - 30 mass section to the solid content 100 mass section of said colloid oxide. In addition, the effectiveness which the good coat material of the workability of coat material spreading is obtained as colloid oxide distribution matter as more than 50 mass % is a water-soluble organic substance at least, and controls migration of the colloid oxide accompanying moisture evaporation also at the time of desiccation of a periphery wall is large, and it is desirable from the ability of a crack not to go into a periphery wall easily. 2% water-solution viscosity in 20 degrees C is the water-soluble cellulosic of 20 or less Pa-s more preferably.
[0022]
Moreover, although it is good for the coat material of this invention to use a cordierite particle and/or ceramic fiber, when a honeycomb body is the nature ceramics of cordierite, it is suitable from the ability of a cordierite particle to make small a coefficient of thermal expansion with a peripheral wall. Furthermore, when a cordierite particle pulverizes and produces a nature of cordierite ceramic honeycomb body, it is desirable from a coefficient-of-thermal-expansion difference being made further small. The reason is that the thermal stress based on a coefficient-of-thermal-expansion difference occurs, and a crack may go into a peripheral wall between a peripheral wall and a honeycomb body when the difference of the coefficient of thermal expansion of a peripheral wall and a honeycomb body is large, and a honeycomb structure object is put to hot exhaust gas.
[0023]
Moreover, if the ceramic fiber which replaces with the aggregate which consists of a cordierite particle, and becomes the part from amorphous silica, an alumina, etc. is used, since progress of a crack can be prevented with the large ceramic fiber of an aspect ratio, it is more effective to the crack initiation of a peripheral wall. Moreover, although the manufacture approach of the ceramic honeycomb structure object of this invention may contain the aggregate which has the thermal resistance of the above-mentioned ceramic fiber or cement besides these although coat material contains the aggregate, a colloid oxide, and the colloid oxide distribution matter, it is not limited to these.
[0024]
Since it applies coat material to a peripheral face, and forms a periphery wall, after the manufacture approach of the ceramic honeycomb structure object of this invention removes the peripheral wall and its periphery section of the baking object which has honeycomb structure by processing in addition to the effectiveness using the coat material of this invention, as described above and it can remove the cel which the periphery section of a peripheral wall deformed, it can make the mechanical strength of a honeycomb structure object high. Moreover, also when the roundness of the whole baking object which has honeycomb structure is low, after processing raises roundness, dimensional accuracy improves by forming a periphery wall.
[0025]
Furthermore, by performing baking actuation after the desiccation after coat material spreading, a cordierite particle and/or ceramic fiber, and a colloid oxide fix the periphery section to the concave of the peripheral face of the ceramic honeycomb structure object body removed by processing, it is firm and a peripheral wall strong also against a thermal shock is formed.
[0026]

Furthermore, when a honeycomb body is formed with the nature ceramics of cordierite, it is desirable from a coefficient-of-thermal-expansion difference with the peripheral wall formed from the coat material which uses a cordierite particle and/or ceramic fiber, and a colloid oxide as a principal component being made small. The reason is that the thermal stress based on a coefficient-of-thermal-expansion difference occurs, and a crack may go into a peripheral wall between a peripheral wall and a honeycomb body when the difference of the coefficient of thermal expansion of a peripheral wall and a honeycomb body is large, and a honeycomb structure object is put to hot exhaust gas.

[0027]

Moreover, the ceramic honeycomb structure object of this invention The periphery wall of a ceramic honeycomb structure object which has the circulation hole of a large number divided by the septum A cordierite particle and/or ceramic fiber, While consisting of a silica matrix formed of the colloidal silica which exists among them From the ratios [So/Sc] of the silicon concentration near the front face of said periphery wall (So) and the silicon concentration (Sc) of the thickness direction core of said periphery wall being 1.00-1.20 It is hard to produce a crack in a peripheral wall at the time of desiccation, and the aggregate which consists of the cordierite particle and/or ceramic fiber of a peripheral wall becomes dedropping with a pile ceramic honeycomb structure object. Since the difference of the content of the peripheral-wall thickness direction of the colloidal silica of a periphery wall becomes large and the amounts of contraction of colloidal silica differ in the thickness direction of a periphery wall in the case of the desiccation after forming a peripheral wall when [So/Sc] exceeds 1.20, in the periphery wall front face where especially the concentration of colloidal silica is high, it becomes easy to produce a crack here. It is because the amount of a silica matrix becomes less than the periphery wall thickness direction core on a periphery wall front face, so a cordierite particle and/or ceramic fiber may be omitted from a peripheral-wall front face on the other hand when [So/Sc] becomes less than 1.00. If a cordierite particle and/or ceramic fiber tend to be omitted from a peripheral-wall front face, handling is difficult and it is not desirable from working efficiency worsening. The more desirable range of [So/Sc] is 1.01-1.10.

[0028]

Moreover, by combining between a cordierite particle and/or ceramic fiber firmly, and forming a periphery wall layer, since the periphery wall of the ceramic honeycomb structure object of this invention consists of a silica matrix formed of a cordierite particle and/or ceramic fiber, and the colloidal silica that exists among them, it is firm and a peripheral wall strong also against a thermal shock is formed.

[0029]

Moreover, the ceramic honeycomb structure object of this invention The periphery wall of a ceramic honeycomb structure object which has the circulation hole of a large number divided by the septum A cordierite particle and/or ceramic fiber, it consists of an alumina matrix formed with the colloidal alumina which exists among them -- both Since the ratios [Ao/Ac] of the aluminum concentration near the front face of said periphery wall (Ao) and the aluminum concentration (Ac) of the thickness direction core of said peripheral wall are 1.00-1.20, it is hard to produce a crack in a peripheral wall at the time of desiccation, and the aggregate serves as a pile ceramic honeycomb structure object dedropping. Since the difference of the content of the peripheral-wall thickness direction of the colloidal alumina of a periphery wall becomes large and the amounts of contraction of a colloidal alumina differ in the thickness direction in the case of the desiccation after forming a peripheral wall when [Ao/Ac] exceeds 1.20, in the peripheral-wall front face where especially the concentration of a colloidal alumina is high, it becomes easy to produce a crack here. It is because the amount of an alumina matrix becomes less than the periphery wall thickness direction core on a periphery wall front face, so a cordierite particle and/or ceramic fiber may be omitted from a periphery wall front face on the other hand when [Ao/Ac] becomes less than 1.00. If a cordierite particle and/or ceramic fiber tend to be omitted from a periphery wall front face, handling is difficult and it is not desirable from working efficiency worsening. The more desirable range of [Ao/Ac] is 1.01-1.10.

[0030]

Moreover, by combining between a cordierite particle and/or ceramic fiber firmly, and forming a periphery wall layer, since the periphery wall of the ceramic honeycomb structure object of this

invention consists of an alumina matrix formed with a cordierite particle and/or ceramic fiber, and the colloidal alumina that exists among them, it is firm and a peripheral wall strong also against a thermal shock is formed.

[0031]

here -- the ratio [So/Sc] of the silicon concentration near the front face of said periphery wall (So), and the silicon concentration (Sc) of the thickness direction core of said periphery wall -- or The ratio [Ao/Ac] of the aluminum concentration near the front face of said periphery wall (Ao) and the aluminum concentration (Ac) of the thickness direction core of said peripheral wall So that the piece of a periphery wall blank test may be started and the cross section of a peripheral wall can be observed After grinding by embedding to the embedding resin for polish and producing the test piece for observation This test piece can be installed in a scanning electron microscope, and the element concentration of the minute-near front face range 12 of a peripheral-wall cross section as shown in drawing 3 , and the core minute range 11 can be computed using EDS (energy dispersive X-ray spectrometer). In addition, near the front face of a periphery wall points out a less than 100-micrometer field to radial [of a honeycomb structure object] from the peripheral-wall outermost surface.

[0032]

[Embodiment of the Invention]

Hereafter, it explains per gestalt of operation of this invention.

(Example 1)

Powder, such as a kaolin, talc; a silica, and an alumina, is adjusted. With a mass ratio SiO2 : It considers as 2O3:33 - 37% of aluminum, and cordierite generation raw material powder which contains MgO:12-15% 48 to 52%. After adding graphite as binders, such as methyl cellulose and hydroxypropyl methylcellulose, lubricant, and ostomy material to this and mixing enough by dry type, ceramic **** which performed addition and sufficient kneading and plasticized the water of the amount of conventions was created.

[0033]

subsequently, a plastic matter -- the well-known object for extrusion molding -- after the peripheral wall 3 and the cell wall 4 considered as the Plastic solid which has the honeycomb structure formed in one by passing a mouthpiece, the nature of cordierite ceramic honeycomb baking object with which the peripheral wall 3 with pitch 1.5mm of 0.3mm of cell wall thickness and a cell wall, an outer-diameter dimension [of 280mm], and an overall length of 300mm and the cell wall 4 were formed in one was acquired by adding desiccation and baking actuation. The porosity of a cell wall was 65% and the average pole diameter was 20 micrometers.

[0034]

By carrying out processing removal of the periphery section of the acquired nature of cordierite ceramic honeycomb baking object using a cylindrical grinder, the honeycomb structure object body with an outer diameter [of 265.7mm] and an overall length of 300mm which has a concave was prepared for the peripheral face.

[0035]

On the other hand, the ceramic raw material of the material property shown in Table 1 and the colloid oxide distribution matter shown in Table 2 were used as coat material, it prepared with the compounding ratio shown in Table 3, and water was added and kneaded further, and it adjusted so that it might become the shape of a paste which can be applied to a honeycomb structure object body. (O) showed to Table 3, having used that whose spreading was completed easily here as spreading nature being good, and since the viscosity of a paste was high, although spreading was possible, it showed the time-consuming thing in Table 3 by (**).

[0036]

[Table 1]

	平均粒子径（μm）	固形分（質量%）	化学組成（質量%）						
			SiO_2	Al_2O_3	MgO	Na_2O	CaO	Fe_2O_3	TiO_2
コージェライト粉末 A	22.4	—	50.3	33.1	13.7	0.4	0.1	0.8	0.2
コージェライト粉末 B	14.2	—	50	34.3	14.2	0.2	0.1	0.7	0.3
コロイダルシリカ	—	50	98	≦0.1	≦0.1	0.5	≦0.1	—	—
コロイダルアルミナ	—	40	≦0.1	99	≦0.1	0.3	≦0.1	—	—

[0037]
[Table 2]

	名称	主要特性
コロイド状酸化物分散物質A	メチルセルロース	2%水溶液粘度(20℃) 4Pa・s
コロイド状酸化物分散物質B	ポリビニルアルコール	4%水溶液粘度(20℃) 5.8Pa・s ケン化度 98.5mol.% 重合度 500
コロイド状酸化物分散物質C	ワックスエマルジョン	固形分40%

[0038]
[Table 3]

コート材NO	骨材	コロイド状酸化物		コロイド状酸化物分散物質		外周壁		外周壁厚さ方向濃度比		ハニカム構造体の特性	
		種類	添加量(質量部*1)	種類	添加量(質量部*2)	塗布性	乾燥割れ	So/Sc	Ac/Ao	耐熱衝撃温度	アイソスタティック強度
1	コージェライトA	コロイダルシリカ	7	A	0	○	×	1.22	–	×	○
2	〃	〃	7	A	1	○	○	1.16	–	△	○
3	〃	〃	7	A	5	○	○	1.13	–	○	◎
4	〃	〃	7	A	7	○	○	1.08	–	◎	◎
5	〃	〃	7	A	14	○	○	1.06	–	◎	◎
6	〃	〃	7	A	28	○	○	1.03	–	◎	◎
7	〃	〃	7	A	40	○	○	1.02	–	◎	○
8	〃	〃	7	A	52	△	○	1.02	–	◎	○
9			2	A	14	○	○	1.08	–	◎	○
10	〃	〃	5	A	14	○	○	1.08	–	◎	◎
11	〃	〃	10	A	14	○	○	1.09	–	◎	◎
12	〃	〃	20	A	14	○	○	1.10	–	◎	◎
13	〃	〃	30	A	14	○	○	1.09	–	○	◎
14			37	A	14	○	○	1.09	–	△	◎
15	〃	〃	7	B	14	○	○	1.05	–	◎	◎
16	〃	〃	7	C	28	○	○	1.06	–	◎	◎
17	コージェライトB	コロイダルシリカ	7	A	0	○	×	1.23	–	×	○
18	〃	〃	7	A	1	○	○	1.18	–	△	○
19		〃	7	A	5	○	○	1.12	–	○	◎
20	〃	〃	7	A	7	○	○	1.10	–	◎	◎
21	〃	〃	7	A	14	○	○	1.08	–	◎	◎
22	〃	〃	7	A	28	○	○	1.07	–	◎	◎
23		〃	7	A	40	○	○	1.04	–	◎	○
24	〃	〃	7	A	52	△	○	1.02	–	◎	○
23	コージェライトA	コロイダルアルミナ	5	A	30	○	○	–	1.05	◎	◎
24	〃	〃	10	A	20	○	○	–	1.06	◎	◎

*1；骨材100質量部に対する固形分の割合
*2；コロイド状酸化物の固形分100質量部に対する割合

[0039]
Subsequently, after applying the various coat material shown in Table 3 to the periphery section of a honeycomb object which has a concave in said prepared periphery section, and performing 120-degree-C hot air drying of 2 hours, the situation of the check of a peripheral wall was checked

visually. It indicated to Table 3, having used as (x) that in which (O) and a check generated what did not have a check in the visual observation result of a check here. The outer diameter of 266.7mm which made the periphery of a honeycomb object fix coat material by the thickness of 0.5mm, the overall length of 300mm, 0.3mm of cell wall thickness, and the honeycomb structure object of the pitch 1.5 of a cell wall were created by performing 850-degree-C baking of 2 hours to the ceramic honeycomb object which carried out desiccation termination.

[0040]

Next, based on automobile specification (JASO) M505-87 of the Society of Automotive Engineers of Japan issue, AISO static disruptive strength was examined for the created ceramic honeycomb structure object. While an AISO static disruptive strength trial seals both ends for an aluminum plate with a thickness of 20mm in contact with the shaft-orientations both-ends side of a ceramic honeycomb structure object based on automobile specification (JASO) M505-87 of the Society of Automotive Engineers of Japan issue What stuck the outer wall section front face with rubber with a thickness of 2mm was put into the pressurized container, water was introduced in the pressurized container, and hydrostatic pressure was applied from the outer wall section front face, and the pressure when destroying was measured and it considered as AISO static reinforcement. And AISO static reinforcement considered the desirable case of 1.5 or more MPas as success (O), the desirable case of 1.8 more or more MPas was made into (O), and rejection (x) showed the case of less than 1.5 MPas.

[0041]

Moreover, thermal shock resistance was evaluated to the acquired ceramic honeycomb structure object. The evaluation trial of thermal shock resistance inserted the ceramic honeycomb structure object into the electric furnace heated by constant temperature (room temperature of +450 degrees C), held it for 30 minutes, was quenched to the room temperature after that, and checked the existence of a crack by visual observation. Moreover, when a crack was not discovered, the temperature of an electric furnace raised 25-degree-C temperature, and the same trial was performed, and it repeated until the crack occurred. And the degree difference of maximum-temperature temperature differential (whenever [stoving temperature] - room temperature) with which a crack was not discovered was made into heat-resistant impact temperature. And the case where heat-resistant impact temperature was 500 degrees C or more was considered as success (**), the desirable case 550 more degrees C or more was made into (O), the more desirable case 600 more degrees C or more was made into (O), and rejection (x) showed the case of less than 500 degrees C.

[0042]

Moreover, it ground by having embedded to the embedding resin for polish, and the test piece for observation was produced so that the piece of a periphery wall blank test of the ceramic honeycomb structure object which ended the AISO static trial might be started and the cross section of a peripheral wall could be observed. This test piece was installed in the scanning electron microscope (made in Hitachi, S-4500), it asked for the element concentration of the minute-near front face range 12 of an envelope cross section as shown in drawing 3 , and the core minute range 11 (20micrometerx100micrometer) using EDS (energy dispersive X-ray spectrometer), and the ratio of concentration [So/Sc] or [Ao/Ac] of the peripheral-wall thickness direction was computed.

The evaluation result of the AISO static reinforcement measured above and heat-resistant impact temperature and the ratio of concentration of the peripheral-wall thickness direction were indicated to Table 3.

[0043]

coat material -- NO.1-8 carry out 7 mass sections addition of the colloidal silica by solid content to the cordierite powder A100 mass section, and further, to the solid content 100 mass section of colloidal silica, 0 - 52 mass section comes out comparatively, and they blend the colloid oxide distribution matter A. the coat material which did not have addition of the colloid distribution matter A among the acquired honeycomb structure objects -- the check occurred, [So/Sc] of the peripheral-wall thickness direction ratio of concentration was over 1.20, and the thing of NO.1 had the large silica concentration difference of a peripheral-wall front face and a peripheral-wall core. For this reason, the check occurred and the judgment of heat-resistant impact temperature was rejection (x) further. the coat material by which the colloid distribution matter A was added on the other hand --

the honeycomb structure object of NO.2-8 did not generate the check, but since it was in 1.00 - 1.20 of [So/Sc] ** of the peripheral-wall thickness direction ratio of concentration, heat-resistant impact temperature was (**) of success, (O), or (O), and AISO static reinforcement was also (O) of success, or (O). Especially, since the rate of the colloid oxide distribution matter of as opposed to the solid content 100 mass section of a colloid oxide in a coat material NO.3-7 honeycomb-structure object was 5 - 50 mass section, the spreading nature of fitness (O) and heat-resistant impact temperature was (O) of success, or (O), and AISO static reinforcement was also (O) of success, or (O). the coat material which blended the colloid oxide distribution matter A exceeding 50 mass sections to the solid content 100 mass section of colloidal silica -- the evaluation of spreading nature of the honeycomb structure object of NO.8 was (**). Furthermore, since the rate of the colloid oxide distribution matter to the solid content 100 mass section of a colloid oxide was 7 - 30 mass section, the coat material NO.4-6 honeycomb-structure object was (O) of success of heat-resistant impact temperature and AISO static reinforcement.

[0044]

coat material -- NO.9-14 carried out 2-37 mass section addition of the colloidal silica by solid content to the cordierite powder A100 mass section, to the solid content 100 mass section of colloidal silica, 14 mass sections came out comparatively and the colloid oxide distribution matter A has blended. Since the colloid oxide distribution matter with which any honeycomb structure object consists of a colloid oxide and a water-soluble organic substance was the coat material by which optimum dose addition was carried out, spreading nature fitness (O) and a check were not generated, either, but [So/Sc] of the peripheral-wall thickness direction ratio of concentration is 1.00-1.20, and AISO static reinforcement was [heat-resistant impact temperature was (**) of success, (O), or (O), and] also (O) of success, or (O). inside -- coat material -- since the honeycomb structure object of NO.10-13 was 5 - 35 mass section of the range where the content rate of the solid content of a colloid oxide to the cordierite aggregate 100 mass section is desirable and it was 14 mass sections of the range where the rate of the colloid oxide distribution matter to the solid content 100 mass section of a colloid oxide is more desirable, heat-resistant impact temperature and AISO static reinforcement of the judgment were success (O)

[0045]

coat material -- NO.15-16 carry out 7 mass sections addition of the colloidal silica by solid content to the cordierite powder A100 mass section, and further, to the solid content 100 mass section of colloidal silica, 14 and 28 mass sections come out comparatively, and they blend the colloid oxide distribution matter B and C. [So/Sc] of the peripheral-wall thickness direction ratio of concentration was 1.00-1.20, and the honeycomb structure object acquired from the colloid oxide distribution matter with which both consist of a colloid oxide and a water-soluble organic substance being included in coat material did not generate spreading nature fitness (O) and a check, either, but was (O) of success of heat-resistant impact temperature and AISO static reinforcement further.

[0046]

coat material -- except for NO.17-24 having used the cordierite powder B -- coat material -- what was blended like NO.1-8 -- it is -- a test result -- coat material -- the same result as NO.1-8 was obtained.

the coat material which did not have addition of the colloid distribution matter A among the acquired honeycomb structure objects -- the check occurred, [So/Sc] of the peripheral-wall thickness direction ratio of concentration was over 1.20, and the thing of NO.17 had the large silica concentration difference of a peripheral-wall front face and a peripheral-wall core. For this reason, the check occurred and the judgment of heat-resistant impact temperature was rejection (x) further. the coat material by which the colloid distribution matter A was added on the other hand -- the honeycomb structure object of NO.18-24 did not generate the check, but since it was in 1.00 - 1.20 of [So/Sc] ** of the peripheral-wall thickness direction ratio of concentration, heat-resistant impact temperature was (**) of success, (O), or (O), and AISO static reinforcement was also (O) of success, or (O). Especially, since the rate of the colloid oxide distribution matter of as opposed to the solid content 100 mass section of a colloid oxide in a coat material NO.19-23 honeycomb-structure object was 5 - 50 mass section, the spreading nature of fitness (O) and heat-resistant impact temperature was (O) of success, or (O), and AISO static reinforcement was also (O) of success, or (O). the coat material

which blended the colloid oxide distribution matter A exceeding 50 mass sections to the solid content 100 mass section of colloidal silica -- the evaluation of spreading nature of the honeycomb structure object of NO.24 was (**). Furthermore, since the rate of the colloid oxide distribution matter to the solid content 100 mass section of a colloid oxide was 7 - 30 mass section, the coat material NO.20-22 honeycomb-structure object was (O) of success of heat-resistant impact temperature and AISO static reinforcement.

[0047]

moreover, coat material NO. -- 25 and 26 -- the cordierite powder A100 mass section -- receiving -- a colloidal alumina -- solid content -- 5 -- and 10 mass sections addition is carried out, further, to the solid content 100 mass section of a colloidal alumina, 30 and 20 mass sections come out comparatively, and the colloid oxide distribution matter A is blended. Since both colloid oxide distribution matter which consists of a colloid oxide and a water-soluble organic substance was in coat material by optimum dose ****, in the spreading nature fitness (O) of coat material, a check did not occur, but [Ao/Ac] of the peripheral-wall thickness direction ratio of concentration was 1.00-1.20, and the acquired honeycomb structure object was (O) of success of heat-resistant impact temperature and AISO static reinforcement.

[0048]

Although the example of a production process of drawing 1 (a) which has a concave in a peripheral face by carrying out processing removal of the periphery section of a nature of cordierite ceramic honeycomb baking object and which forms a peripheral wall in the peripheral face of a honeycomb structure object explained the above If it carries out from the operation effectiveness of this invention, after carrying out processing removal of the periphery section of a nature of cordierite ceramic honeycomb desiccation object, by carrying out baking Even if it adopts the production process of drawing 1 (b) which forms a peripheral wall as the peripheral face of the honeycomb structure object which has a concave in a peripheral face, it cannot be overemphasized that the same result is obtained.

[0049]

[Effect of the Invention]

As mentioned above, according to the coat material for forming the peripheral wall of the ceramic honeycomb structure object of this invention as explanation In a desiccation process since coat material contains appropriately the aggregate, a colloid oxide, and the colloid oxide distribution matter While being able to prevent the crack of the peripheral wall for which the concentration difference of the configuration element of the peripheral-wall thickness direction stops being able to generate easily and which is generated at a desiccation process, the coat material which can form the periphery wall having thermal shock resistance, reinforcement, and dependability of a ceramic honeycomb structure object can be offered.

Moreover, while being able to make high the mechanical strength of a ceramic honeycomb structure object by using the manufacture approach of the ceramic honeycomb structure object of this invention in addition to the effectiveness of the coat material of above-mentioned this invention, the ceramic honeycomb structure object whose dimensional accuracy of a peripheral wall improved can be acquired.

Furthermore, according to the ceramic honeycomb structure object of this invention, since the concentration difference of the oxide matrix formed with the colloid oxide is small near the front face of a peripheral wall, and between a core, it is hard to produce a crack in a peripheral wall at the time of desiccation, and the ceramic honeycomb structure having thermal shock resistance, reinforcement, and dependability can be acquired.

[Brief Description of the Drawings]

[Drawing 1] It is process drawing of the gestalt of operation.

[Drawing 2] It is the perspective view of a honeycomb structure object.

[Drawing 3] It is the schematic drawing showing the analysis part at the time of computing the thickness direction ratio of concentration of the peripheral wall of a honeycomb structure object.

[Description of Notations]

1: Honeycomb structure object

2: Cel

3: Peripheral wall
4: Cell wall
11: The core minute range of a peripheral-wall cross section
12: The minute-near front face range of a peripheral-wall cross section

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[Translation done.]

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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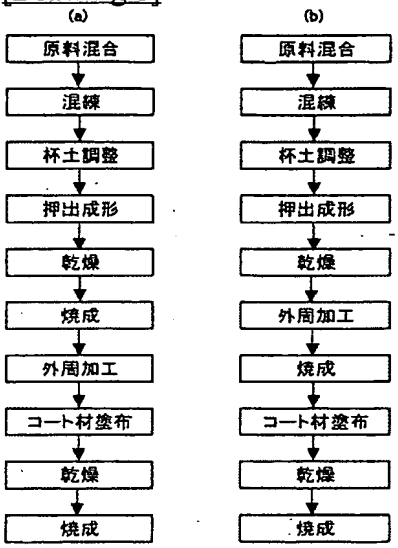
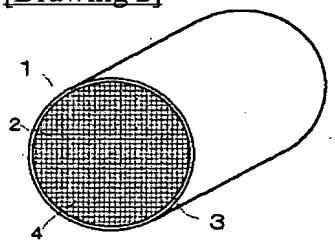
DRAWINGS

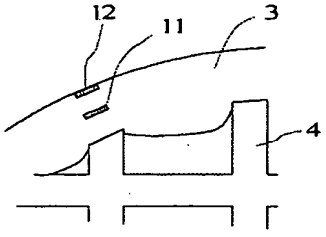
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]